CECS 228 Name:

Lab 6.2 ID: Date:  
Objective:

* Be able to identify equivalence relation
* Be able to compute composition of relation
* Be able to identify partial ordering relation

Exercise 1: Which of these relations on the set of all people are equivalence relations? Determine the properties of an equivalence relation that the others lack.

a) {(a, b) | a and b are the same age}

b) {(a, b) | a and b speak a common language}

c) {(a, b) | a and b have met}

Exercise 2:  
Let R be the relation {(1, 2), (1, 3), (2, 3), (2, 4), (3, 1)}, and let S be the relation {(2, 1), (3, 1), (3, 2), (4, 2)}. Find S ◦ R.

Exercise 3:   
R1 = {(a, b) ∈ | a > b}, the “greater than” relation,

R2 = {(a, b) ∈ | a ≥ b}, the “greater than or equal to” relation,

R3 = {(a, b) ∈ | a < b}, the “less than” relation,

R4 = {(a, b) ∈ | a ≤ b}, the “less than or equal to” relation,

R5 = {(a, b) ∈ | a = b}, the “equal to” relation,

R6 = {(a, b) ∈ | a ≠ b}, the “unequal to” relation.  
a) R1 ◦ R4.

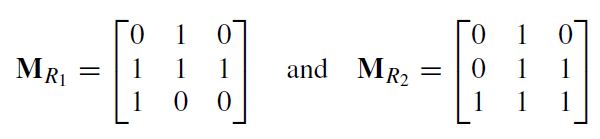
b) R1 ◦ R6.

c) R2 ◦ R3.

d) R3 ◦ R3.

e) R1 ◦ R5.

Exercise 4: Let R1 and R2 be relations on a set A represented by the matrices



Find the matrices that represent

a) R1 ∪ R2.

b) R1 ∩ R2.

c) R2 ◦ R1.

d) R1 ◦ R1.

Exercise 5: Which of these relations on {0, 1, 2, 3} are partial orderings?

Determine the properties of a partial ordering that the others lack.

a) {(0, 0), (2, 2), (3, 3)}

b) {(0, 0), (1, 1), (1, 2), (2, 2), (3, 1), (3, 3)}

c) {(0, 0), (0, 1), (0, 2), (0, 3), (1, 0), (1, 1), (1, 2), (1, 3), (2, 0), (2, 2), (3, 3)}

Exercise 6: Answer these questions for the poset ({{1}, {2}, {4}, {1, 2}, {1, 4}, {2, 4}, {3, 4}, {1, 3, 4}, {2, 3, 4}}, ⊆).

a) Find the maximal elements.

b) Find the minimal elements.

c) Is there a greatest element?

d) Is there a least element?

e) Find all upper bounds of {{2}, {4}}.

f) Find the least upper bound of {{2}, {4}}, if it exists.

g) Find all lower bounds of {{1, 3, 4}, {2, 3, 4}}.

h) Find the greatest lower bound of {{1, 3, 4}, {2, 3, 4}}, if it exists.